ON THE DISTRIBUTION OF *CALLINECTES ORNATUS* ORDWAY,1863 AND *CALLINECTES DANAE* SMITH, 1869 (BRACHYURA, PORTUNIDAE) IN THE FORTALEZA BAY, UBATUBA, BRAZIL.

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ABSTRACT

The spatial and seasonal distribution of *Callinectes ornatus* Ordway, 1863 and *Callinectes danae* Smith, 1869 on the sublittoral sediments from Fortaleza bay, Ubatuba, SP, Brazil and their reproductive periods were analysed. The samples were taken monthly throughout the year (from November/88 to October/89), with a shrimp fishery boat equipped with two otter-trawl. The collects were made in seven subareas considering the physical features of each one (the depth of the site, the presence of a rocky wall or a beach along the bounderies, inflow of freshwater, organic content and granulometric composition of the sediment) and the position of each one in relation to the bay mouth. Both species can be inhabiting anyone subareas. The highest abundance of *C. ornatus* was registered in March on subarea 2, while *C. danae* occured in May on subarea 4. The ovigerous females of *C. ornatus* can be captured in deep waters of the bay along the year, with the highest frequency in summer. The ovigerous females of *C. danae* occured in low salinities and shallow waters appearing only in winter. Such facts are probably associated with some habitat partitioning strategy by these species and/or other Portunidae crabs in the bay.

KEYWORDS. Portunidae, *Callinectes*, swimming crab, Brazilian coast, distribution.

INTRODUCTION

The studies about the portunids raise a great interest due to their large number of important species as fishing resource, their wide geographic distribution and to their use as water mass indicator contributing to determine, together with other organisms, the biogeographic region of the sea as have mentioned by TAISSOUN (1973).

The Portunidae presents about 300 described species. According to WILLIAMS (1984) the genus *Callinectes* Stimpson, 1860 has 14 species confined almost exclusively to shallow coastal waters. There are 11 species occuring in the Atlantic and 3 in the Pacific oceans.

The species can be widely or restrictly distributed in function of environmental factors. The variation of some environmental factors can limit the particular species oc-

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currence which due to their low tolerance to each factor or to a group of them, appear more localized or endemical. A species tends to have a particular spatial distribution pattern in function of environmental gradients, but some biotic factors as predation, food availability or molting process can influence the species distribution too. However the relative importance of these selective pressures changes with life history stage (SHIRLEY **et al.**, 1990). According to RYER **et al.** (1990) further investigation of the spatial and temporal aspects of interhabitat movements would greatly increase our understanding of blue crab population dynamics and interactions within estuarine communities.

As brachyuran crabs present pleopod egg incubation, we can evaluate when the species are breeding by ovigerous females frequency records in the population. A population can present a continuous breeding, if it occurs with the same intensity along the year; or a periodic breeding if it occurs exclusively, or more intensively, in a specific season (SANTOS, 1978).

In populational studies, it is often fundamental to know the kind of reproduction and the period of its occurrence. This information can be valuable to determine the species growth and it is necessary to the governmental fishery control.

This study aims to compare the distribution of *Callinectes ornatus* Ordway, 1863 and *Callinectes danae* Smith, 1869 on the sublittoral sediments from the Fortaleza Bay, Ubatuba, São Paulo, in function to some analysed environmental factors. The species reproductive periods based on ovigerous females occurrence are comparatively analysed too.

MATERIAL AND METHODS

The bay was divided into seven subareas differing in their location to the bay mouth, the presence of a rocky wall or a beach along the bounderies, the inflow of fresh water, depth, organic content and granulometric composition of the sediments. Each subarea corresponds to a radial (indicated by roman number), for the biological sampling and to a station (indicated by a arabic number) for the environmental data (fig. 1). Detailed descriptions of the Fortaleza Bay in terms of physical and chemical features are in NEGREIROS-FRANSOZO **et al.** (1991).

The description of each subarea is as follows: Subarea 1. The mid-portion between Saco Grande and Sununga Point. The site is relatively exposed to the open sea and has high wave energy. It is lined by a rocky coast which acts as a barrier to the water, inducing strong breakers. The mean depth value is 11.2 ± 0.9 meters and the organic content in the sediment is 4.4 ± 2.5 %. The predominant granulometric fraction of the sediment is very fine sand. There is no residential development along the coast in front of this site.

Subarea 2. This site is parallel to Lazaro beach and sheltered by the Sununga Point. This region has calm water because it is not directed to the bay mouth. In the coast there is a littoral plain with a large number of residential developments. The mean depth value is 7.0 ± 0.9 meters and the organic content in the sediment is 6.7 ± 2.4 %. The predominant granulometric fraction of the sediment is silt-clay.

Subarea 3. This site is parallel to the rocky coast between Domingas Dias and Barra beaches. This subarea faces the bay mouth and is located on the right side of the estuary. The wave energy of this site is high. There is no residential development along the coast in front of this site. The mean depth value is 8.5 ± 0.9 meters and the organic content in the sediment is 2.3 ± 1.3 %. The predominant granulometric fractions of the sediment are very fine sand and silt-clay.

Subarea 4. It is located in the portion in front of the estuaries (Comprido and Escuro rivers) and directed towards the bay mouth. The wave energy is relatively low. There are a few residential developments along the Dura beach which is the nearest this line trawl. The mean depth value is 4.4 ± 0.6 meters and the organic content is 1.8 ± 1.3 %. The predominant granulometric fractions are very fine sand and silt-clay.

Subarea 5. This site is located parallel to Fortaleza beach which is sheltered by the Fortaleza Point.

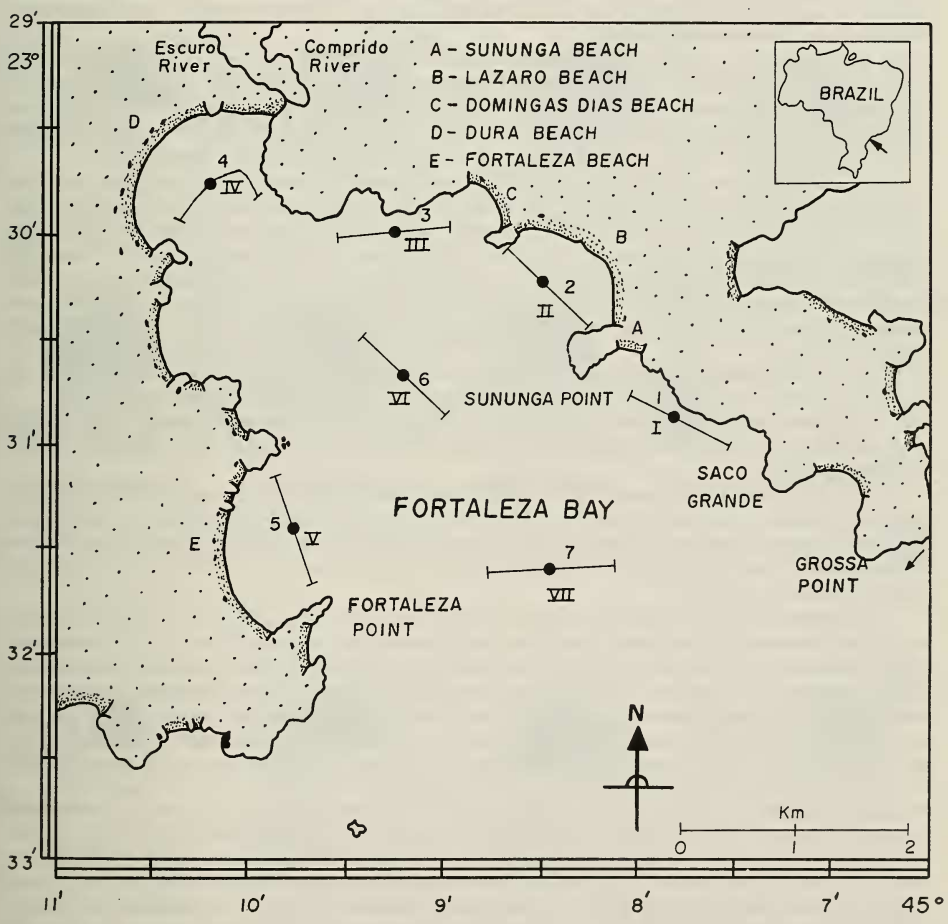


Fig. 1. Fortaleza bay, Ubatuba (SP) Brazil localization indicating the seven sampled subareas: 1-7 for station and I-VII for radials.

This subarea has low wave energy because it is not directed to the bay mouth. In the coast there is a littoral plain with a very few residential developments. The mean depth value is 7.1 ± 0.8 meters and 3.5 ± 1.4 % of organic content of the sediment. The predominant granulometric fractions of the sediment are fine and very fine sand.

Subarea 6. This site is located in the middle of the bay. The mean depth value is 11.1 ± 1.2 meters and the organic content of the sediment is 5.1 ± 1.8 %. The predominant granulometric fractions are very fine sand and silt-clay.

Subarea 7. It is located in the bay mouth, between Fortaleza and Grossa Points. The mean depth value is 13.3 ± 1.6 meters and the organic content of the sediment is 4.6 ± 3.6 %. The predominant granulometric fractions are very fine sand and silt-clay.

Collections were made monthly during one year from November, 1988 to October, 1989 in all subareas. They were made in each subarea one tow per month during the daylight at the high tide. These 84 samples were obtained by means of a shrimp fishery vessel equipped with paired otter-trawls (3.7 m wide mouth; 15 mm mesh net body; 10 mm mesh cod end liner). The trawl track lasted 23 minutes at 1.47 knots in a constant speed. Each monthly collections were made on the same day in each subarea to reduce the daily influence of weather changes on the catches of crabs.

After trawling at a subarea the vessel went back to the mid point of the trawl track, so that the data on environmental factors could be obtained. In order to record the water temperature, salinity, and amount of dissolved oxygen, some bottom water was collected with a Nansen bottle and surface water with a bucket from which water temperature, salinity, and amount of dissolved oxygen were obtained. Temperature (°C) was measured with a stem thermometer and salinity (‰) with a rephractometer (American Optical).

In order to determine the amount of dissolved oxygen, water was transferred with the aid of a siphon to Ambergris flasks (250 ml), labeled with the station number. The oxygen content was obtained according to the method proposed by GOLTERMAN & CLYMO (1969), modified by the addition of sodium azide (NaN_3). Depth was determined at each station by means of a 50 cm graduated rope that was attached to the van-Veen grab (1/40 m^2) used to obtain samples of sediment. In the laboratory, about 300g of sediment were put in a labeled Petri dish and left in a stove at 70° C, during 72 hours. After drying, the sediment samples were divided in sub-units from which the amount of organic material was determined and bulk granulometry analyses were made.

The content of organic matter was obtained by ash-weighing. The granulometric fractions were obtained by the differential sifting, based on the Wentworth scale (WENTWORTH, 1922).

All the swimming crabs in the collections were counted and the sex and maturity stage of each animal were recorded. If individuals had sealed abdominal somites, they were classified as juveniles according to TAISSOUN (1970).

The individuals were separated in five groups: adult males (AM); adult females (AF); ovigerous females (OF); juvenile male (JM) and juvenile female (JF) for which the absolute abundance was calculated based on the number of swimming crabs registered in each collecting radial per month. The specimens utilized are maintained in the Collection of the Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista, Botucatu, SP.

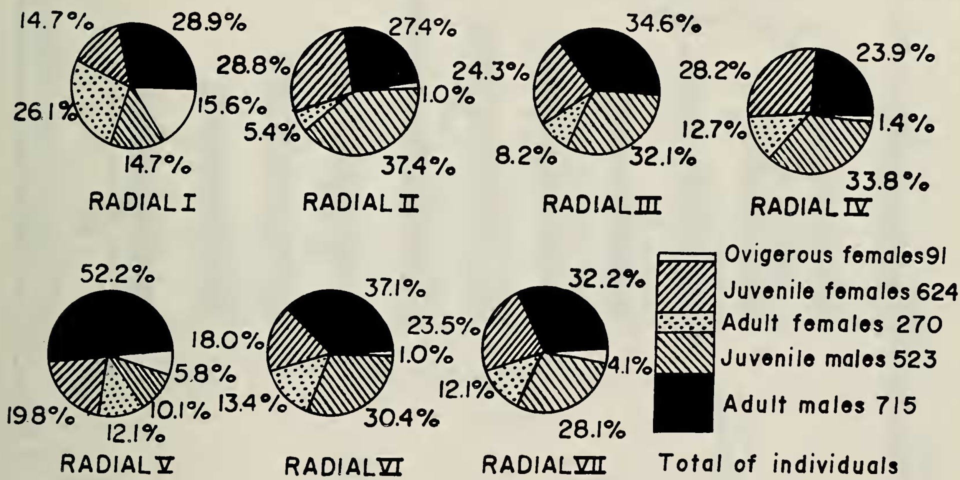
The Pearson´s linear correlation was made in order to determine the existence of a correlation between the absolute abundance of the studied species and each analysed environmental factor (depth, temperature, salinity, dissolved oxygen, organic material and the seven granulometric fractions of sediments). The canonical correlation analysis was utilized to determine some probable correlation between the absolute abundance of each species and an environmental variable set. Two sets of environmental variables were established. The first one was composed by depth, temperature, salinity, dissolved oxygen and organic material of the sediments and the second one by the seven granulometric fractions of the sediments. The significance level was verified by the chi-square test.

The Goodman´s statistical test (GOODMAN, 1964; 1965) was utilized to compare the multinomials proportions obtained. The comparisons were done among the individuals proportions of the subareas in each sexual category and among the individuals proportions of the sexual category in each subarea. The statistical study of the individuals frequency, for both species in the monthly sampled subarea during one year, carried out by means the Variance Analyses using completely randomized block experiments complemented by Tukey´s multiple test of comparisons (OSTLE, 1973). For these study the variable "individual frequency" was considered under the follow transformation = root square of observed value plus 0.5.

RESULTS

The blue crab total number is 2,223 for *C. ornatus* and 101 for *C. danae*. The figures 2 and 3 show the spatial distribution of the total number of captured individuals in each radial according to each category based on sex, morphological maturity and ovigerous condition.

Both species can occur in any sampled subarea. *C. danae* is most frequent in subarea 4 while *C. ornatus* is most often in subarea 2. The spatial distribution of ovigerous



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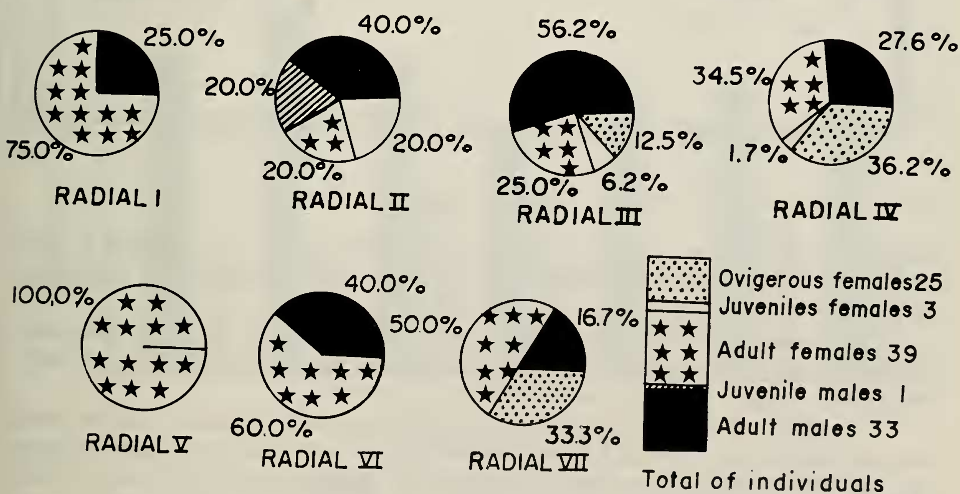

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Figs. 2-3. Spatial distribution: 2, *C. ornatus;* 3, *C. danae.*

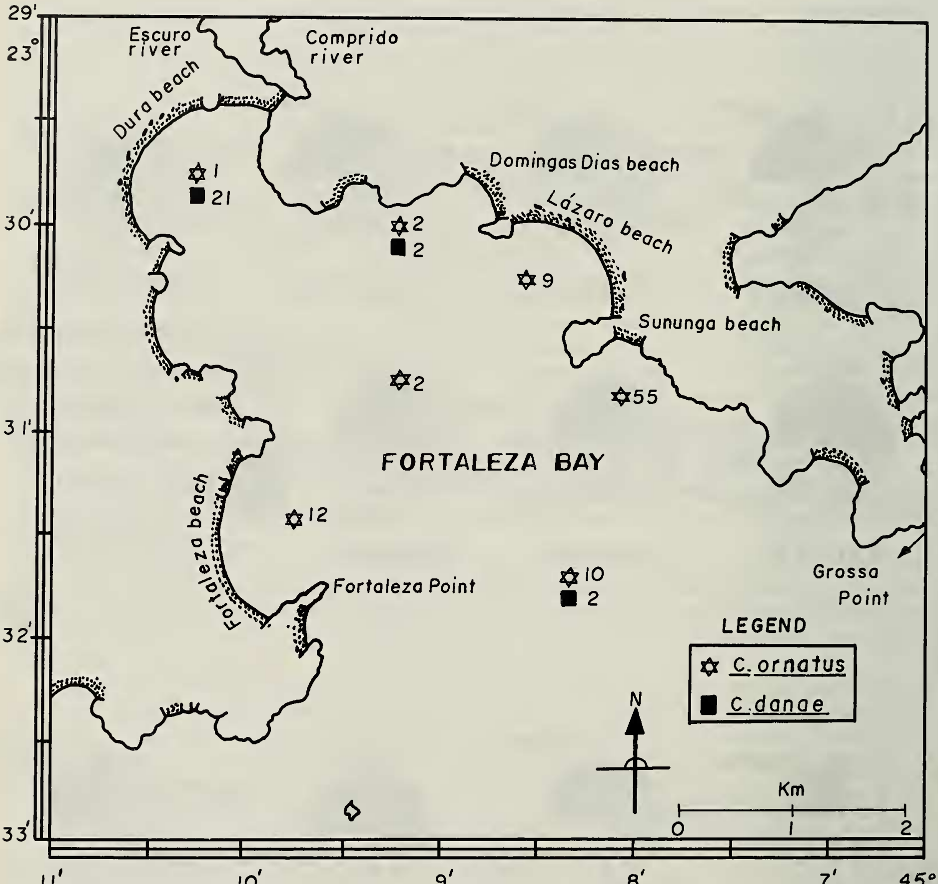
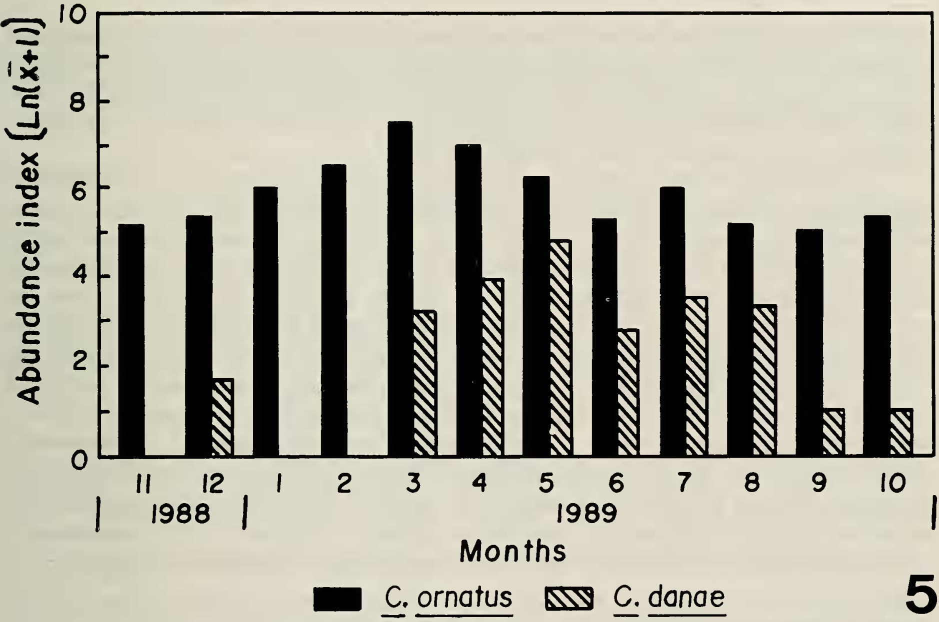


Fig. 4. Spatial distribution of the ovigerous females of *C. ornatus* and *C. danae*.

females is presented in the figure 4. Juveniles blue crabs were most abundant for both species in subarea 2 which is characterized by calm waters, sediments with gravel fractions and with the highest organic material sediment content.

The abundance index for the studies species in each subarea (fig. 5) for adult males and females of *C. danae* were progressively more abundants in the subareas 4, 3 and 6 while the *C. ornatus* ones were in the subareas 1, 2 and 5.

The observed seasonal distribution (fig. 6) showed that *C. ornatus* could be along the year but *C. danae* could not. The *C. ornatus* ovigerous females were captured along the year with the highest intensity in summer when they appeared in high salinity deep water. Those of *C. danae* appear only in winter occurring in low salinity shallow water. The ovigerous female proportions to the total number of them, distributed for each month, are presented in table I. In the Pearson´s linear correlation analysis it was verified



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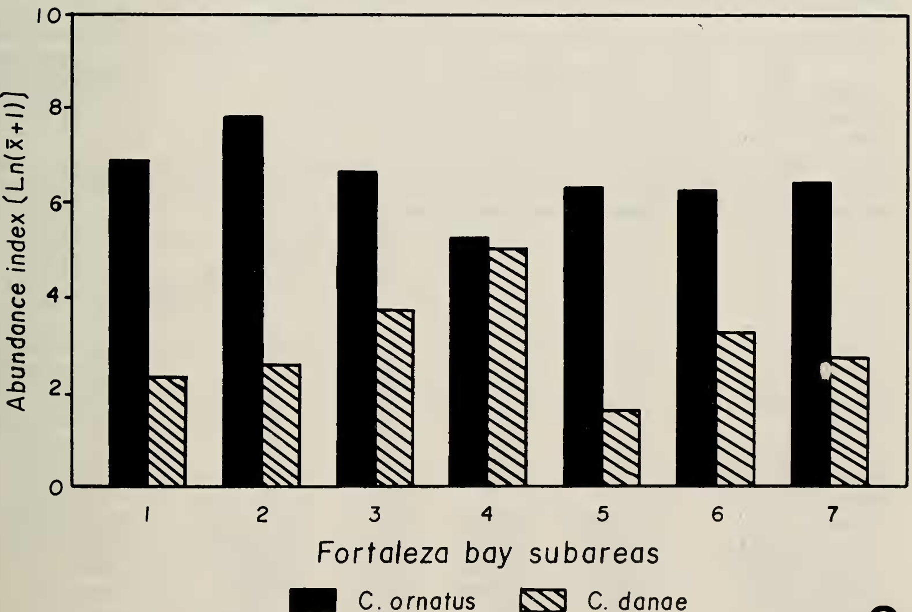

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Figs. 5-6. Abundance index of *C. ornatus* and *C. danae* in the Fortaleza bay, Ubatuba (SP): 5, in each subarea; 6, in each month.

significatives coefficients for both species (tables II, III), respectively, for *C. ornatus* and *C. danae*. The species *C. ornatus* presented significative association with the following factors: temperature, salinity and some sediment fractions (gravel, very coarse sand, coarse sand, medium sand and very fine sand) and *C. danae* with depth, dissolved oxygen content and only one sediment fraction (very fine sand).

The results of the canonical correlation analysis (tables IV, V) showed the granulometric sediment fractions set in all individual categories were the most remarkable coefficients obtained for *C. ornatus* while *C. danae* presented significant coefficients in the first set of variables with the total of individuals and ovigerous females but did not present anyone significant coefficient with the granulometric sediment fractions set. The comparison (table VI) made between individuals proportions in each subarea and each sexual category revealed adult males were predominant in the radial V, but they did not differ as to III and VI while adult females and ovigerous females were most abundants in radial I. The radial II presented the highest proportion of juveniles when it was compared among the others. From the comparisons made between *C. danae* individuals proportions, the results showed (table VII) that although adult males were most abundant in radial III, they only differ from radial V while adult females were most abundant in radial V, but they did not differ as to radials I, VI and VII. The abundance of *C. danae* juveniles in the bay was very low, they only appear in radials II, III and IV.

Table I. *Callicnetes ornatus* (N=91) and *C. danae* (N=25) ovigerous females proportions in each collecting month in Fortaleza bay.

DATE	1988		1989									
	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.
C. ornatus	0.11	0.55	1.3	2.97	3.3	0.55	0.77	0	0	0	0.22	0.22
C. danae	0	0	0	0	0	1.20	4.80	0	2	2	0	0

Table II. Coefficients of Pearson's linear correlation carried out between the absolute abundance of *C. ornatus* and the sampled environmental factors for each group of individuals (AM= adult males; AF= adult females; J= juveniles; OF = ovigerous females; T= total); and the descriptive levels.

VARIABLES	COEFFICIENTS				
	AM	AF	OF	J	T
DEPTH	-0.044	0.170	0.179	-0.105	-0.047
TEMPERATURE	0.348**	0.348**	0.192	0.307**	0.359**
SALINITY	-0.267*	-0.136	-0.059	-0.255*	-0.265*
DISSOLVED OXYGEN	0.176	-0.052	0.112	-0.122	-0.129
ORGANIC MATERIAL	0.100	-0.028	-0.025	0.110	0.100
SEDIMENT					
Gravel	0.503**	0.166	0.038	0.616**	0.572**
Very Coarse Sand	0.350**	0.209*	0.166	0.447**	0.432**
Coarse Sand	0.161	0.411**	0.481**	0.125	0.214*
Medium Sand	0.167	0.298*	0.324**	0.134	0.196
Fine Sand	0.052	-0.111	-0.094	-0.003	-0.008
Very Fine Sand	-0.237*	-0.204	-0.234*	-0.224*	-0.257*
Silt-Clay	-0.095	-0.142	-0.122	-0.069	-0.098

(* P < 0,05; ** P<0,01)

Table III. Coefficients of Pearson's linear correlation carried out between the absolute abundance of *C. danae* and the sampled environmental factors for each group of individuals (AM = adult males; AF= adult females; OF= ovigerous females; J= juveniles and T = total); and the descriptive levels.

VARIABLES	COEFFICIENTS				
	AM	AF	OF	J	T
DEPTH	-0.190	-0.154	-0.285**	-0.144	-0.255*
TEMPERATURE	0.133	0.072	0.028	0.065	0.086
SALINITY	-0.025	0.106	0.051	-0.018	0.051
DISSOLVED OXYGEN	-0.275**	-0.311**	-0.290**	0.007	-0.312**
ORGANIC MATERIAL	-0.144	-0.169	-0.239*	0.029	-0.193
SEDIMENT					
Gravel	-0.082	-0.068	-0.080	-0.004	-0.081
Very Coarse Sand	-0.114	-0.007	-0.111	-0.077	-0.105
Coarse Sand	-0.132	-0.040	-0.141	-0.087	-0.110
Medium Sand	-0.140	-0.064	-0.137	-0.029	-0.118
Fine Sand	-0.136	-0.106	-0.125	-0.022	-0.130
Very Fine Sand	0.253*	0.186	-0.287**	0.020	0.254*
Silt-Clay	-0.069	-0.112	-0.139	-0.063	-0.111

(* P<0,05; ** P<0,01)

Table IV. Coefficients of Canonical correlation carried out between the absolute abundance of *Callinectes ornatus* and two sets of environmental factors for each group of individuals (AM= adult males; AF= adult females; J = juveniles; OF = ovigerous females; T= total); and the descriptive levels.

	SETS OF ENVIRONMENTAL FACTORS	COEFFICIENTS				
		AM	AF	OF	J	T
	DEPTH	-0.010	0.659	0.834	-0.208	0.005
	TEMPERATURE	0.629	0.815	0.654	0.615	0.705
I	SALINITY	-0.398	-0.228	-0.122	-0.347	-0.366
	DISSOLVED OXYGEN	-0.470	-0.041	-0.538	-0.420	-0.358
	ORGANIC MATERIAL	0.294	-0.154	-0.255	0.390	0.290
	CANONICAL	0.437**	0.428**	0.348NS	0.393*	0.423**
	COEFICIENT X^2	17.061	16.320	10.412	13.525	15.911
	SEDIMENT					
	Gravel	-0.990	0.236	0.125	0.737	0.978
	Very Coarse Sand	-1.781	-0.875	-0.661	-0.006	-0.031
	Coarse Sand	-3.983	0.833	1.372	-0.456	0.228
II	Medium Sand	-6.769	-1.583	-0.940	-0.257	0.080
	Fine Sand	-6.826	-1.222	-0.478	-0.743	0.006
	Very Fine Sand	-13.224	-2.555	-1.367	-1.235	-0.197
	Silt-Clay	-7.039	-1.271	-0.581	-0.421	0.271
	CANONICAL	0.548**	0.563***	0.686***	0.668***	0.635***
	COEFFICIENT X^2	28.421	30.254	50.562	46.913	41.035

(***P<0,001; ** P<0,01; * P<0,05; NS P>0,05)

Table V. Coefficients of Canonical correlation carried out between the absolute abundance of *Callinectes danae* and two sets of environmental factors for each group of individuals (AM= adult males; AF= adult females; OF = ovigerous females; J= juveniles and T= total); and the descriptive levels.

SETS OF ENVIRONMENTAL FACTORS		COEFFICIENTS				
		AM	AF	OF	J	T
	DEPTH	-0.613	-0.604	-0.746	-1.025	-0.684
	TEMPERATURE	0.183	-0.143	-0.093	0.450	0.083
I	SALINITY	0.039	0.349	0.147	0.511	0.205
	DISSOLVED OXYGEN	-0.809	-0.789	-0.702	-0.081	-0.774
	ORGANIC MATERIAL	-0.127	-0.125	-0.245	0.527	-0.158
CANONICAL		0.381*	0.407*	0.480**	0.182NS	0.444**
COEFICIENT X^2		12.620	14.562	21.070	2.702	17.650
SEDIMENT						
	Gravel	0.649	0.733	0.534	-0.890	0.109
	Very Coarse Sand	0.529	0.345	0.583	0.695	0.097
	Coarse Sand	1.323	2.098	1.216	-3.061	0.582
II	Medium Sand	2.249	2.472	2.174	0.195	0.594
	Fine Sand	1.984	2.271	1.858	-1.542	0.291
	Very Fine Sand	5.352	5.749	5.060	-2.605	2.133
	Silt-Clay	2.285	2.098	1.799	-0.955	0.255
CANONICAL		0.325NS	0.272NS	0.395NS	0.180NS	0.322NS
COEFFICIENT X^2		8.862	6.101	13.503	2.616	8.717

(**P<0,01;* P<0,05; NS P>0,05)

Table VI. *Callinectes ornatus*. Results of the multinomial proportions comparisons by Goodman's test (AM = adult males; AF = adult females; J = juveniles; OF = ovigerous females; T = total); and the descriptive levels. (The capital letters represent the comparisons between the sexual categories in each radial; the small letters represent the comparisons between the radials in each sexual categories).

RADIALS	SEXUAL CATEGORIES					TOTAL N
	AM	JM	AF	JF	OF	
I	0.250a B	0.125a A	0.360d B	0.130a A	0.135b A	408
II	0.271a C	0.283b C	0.063a B	0.373b D	0.010a A	899
III	0.344ab C	0.248b C	0.089ab B	0.312b C	0.007a A	282
IV	0.236a B	0.278ab B	0.139abc B	0.333b B	0.014a A	72
V	0.493b C	0.183ab B	0.169bc B	0.100a AB	0.055a A	219
VI	0.367ab D	0.189ab BC	0.143abc B	0.291b CD	0.010a A	196
VII	0.315a C	0.130a B	0.239c C	0.273b C	0.042a A	238

Table VII. *Callinectes danae*. Results of the multinomial proportions comparisons by Goodman's test. (AM = adult males; AF = adult females; J = juveniles; OF = ovigerous females; T = total); and the descriptive levels. (The capital letters represent the comparisons between the sexual categories in each radial; the small letters represent the comparisons between the radials in each sexual categories).

RADIALS	SEXUAL CATEGORIES					TOTAL N
	AM	JM	AF	JF	OF	
I	0.250ab AB	0.0a A	0.749ab B	0.0a A	0.0a A	4
II	0.400ab A	0.200a A	0.200a A	0.200a A	0.0a A	5
III	0.500b B	0.0a A	0.333a B	0.056a A	0.111ab AB	18
IV	0.203ab B	0.0a A	0.519a C	0.013a A	0.266b A	79
V	0.0a A	0.0a A	0.998b B	0.0a A	0.0a A	2
VI	0.400ab B	0.0a A	0.600ab B	0.0a A	0.0a A	10
VII	0.167ab A	0.0a A	0.833ab B	0.0a A	0.0a A	6

Table VIII. Results of statistical analyses of the mean number of individuals collected in each subarea. (* the means followed by at least one same letter in the column do not differ as to radial).

RADIAL	*C. ornatus* ($P<0.01$)	RADIAL	*C. danae* ($P<0.05$)
IV	2.33a*	V	0.80a*
VI	3.46ab	I	0.86ab
V	3.70ab	II	0.91ab
VII	3.72ab	VII	0.94ab
III	4.26ab	VI	1.06ab
I	4.48ab	III	1.14ab
II	6.84b	IV	1.73b

The variance analyses (table VIII) has revealed that the occurrence of individuals only differs between the radials IV and II for *C. ornatus* and between the radials V and IV for *C. danae*.

DISCUSSION

São Paulo North littoral line is very irregular with many bays which form a great deal of environmental diversity. Some points of this coast have a little of freshwater inflow which with another propitious conditions together allow the occurrence of special kinds of organisms. The Fortaleza bay is no exception.

With reference to the reproductive aspects, in spite of the absence of ovigerous females in winter, the available obtained data suggest that *C. ornatus* can reproduces all the year because it can be found juveniles in all collecting months. With relation to *C. danae* the informations obtained show that this species can be reproducing during the winter but it is necessary further investigation because this species is not only distributed in the bay, but may be in the estuary.

Euryhaline species as *C. danae* are found in some life phase at low salinity and in other at high salinity environments (PITA **et al.**, 1985). The same occurs to other Portunidae species as *C. sapidus* Rathbun, 1896 studied by CHURCHILL (1919), DARNELL (1959) and BUCHANAN & STONER (1988) and *C. arcuatus* Ordway studied by DEVRIES **et al.**(1983) and DITTEL **et al.** (1985).

The *C. danae* greatest abundance period in the bay is the same of its ovigerous females. According to GASPAR (1981 unpublished thesis), who studied this species in the Itiberê river, Paraná (Brazil), *C. danae* ovigerous females were not founded. It was supposed that they grow and develop in the coastal rivers and the mature adult females migrate to sea water to spawn, egg incubation and develop their larvae in the plancton. After the metamorphosis the juveniles go back to the estuaries and mangrove areas. To *C. ornatus*, apparently, these mechanisms do not occur because the species has been very abundant in while bay for all analysed categories.

BOURGEOIS-LEBEL **et al.** (1982) studing six species of *Callinectes* revealed that each species are predominant in one site of Guadeloupe mangrove swamps but in the period of the puberty molt the females migrate to the males specific habitat for mate and so, they move back to their site for spawing and egg incubation.

Although pre-molt and ecdysis occupy a small proportion of a crustacean´s life, they represent a critical life history event required for growth and, in females of some species like blue crabs, for mating (WOLCOTT & HINES, 1990). According these authors, because decapod crustaceans tend to hide during ecdysis, there are little about the microhabitats selection for molting in the literature.

The spatial partitioning of the environment can be also related to the bottom features as already been reported by JEFFRIES (1966) for *Cancer borealis* Stimpson, 1859 and *Cancer irroratus* Say, 1817. Predation has also a strong influence on habitat selection (MAJOR, 1977; WILSON **et al.**, 1987 and SHIRLEY **et al.**, 1990).

The distinguished distribution observed in the present work for *C. ornatus* and *C. danae* in the Fortaleza Bay points out a dominance of the first species in a whole bay and a retaining of the second one neaby the mangrove area.

Another detailed studies about the gonad development, molt cycle and trophic relations for both species associated with their distribuiton patterns can be proper for the species partitioning habitat knowledgement. According to HINES **et al.** (1987) data as these indicate that habitat utilization within estuaries by blue crabs is considerably more complex than that indicated by the life history paradigm of *Callinectes sapidus*.

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